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Historic Vegetation of The Nature Conservancy's Chinquapin Preserve, Woodford County, Central Illinois

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ABSTRACT

The historic vegetation of The Nature Conservancy's (TNC) Chinquapin Preserve located in Woodford County, Illinois, and some of the surrounding area, which included three townships (Kansas, Palestine, and Montgomery), was determined using the General Land Survey Field Notes (1821-1833). Vegetation densities at section and quarter section points were estimated using a modified point-centered quarter method and placed in four density-based categories (prairie, savanna, open forest, and closed forest). The historic vegetation was primarily prairie (55.5%) and savanna (35.3%) with oak and hickory dominated forests occurring along waterways and ravines. White oak, black oak, and hickory accounted for 81% of all trees in the study area. The field notes for the three townships were notable for the absence of maple tree records, which are an important taxon in current upland forest of the study area. The Conservancy's property, as described by surveyors and based on our analysis, ranged from treeless prairie to closed forest. The forests in the area of the properties were all described as, "oak hickory" forests. This study indicates that restoration of The Nature Conservancy's properties to correspond to historic vegetation should include forests dominated by white oak, black oak, and hickory trees (with a few elm and walnut trees) near the river channel, and savanna grading into prairie away from the Mackinaw River. Sugar maple (*Acer saccharum*) should be nearly eliminated from forests on upland sites.

INTRODUCTION

On December 7, 1997, The Nature Conservancy (TNC) of Illinois purchased 268 hectares of the former Bateman Estate (currently called the Chinquapin Preserve) in Woodford County, Illinois. The Chinquapin Preserve consists of three noncontiguous parcels of land located in sections 4, 5, and 9 of Kansas Township (Township 25N Range 3E of the 3rd Principal Meridian), and a small parcel located in section 33 of Palestine Township (T 26N R 3E of the 3rd PM). The Mackinaw River runs through two of the properties (Fig. 1). The stated plans for the property include, "restoring permanent vegetation to the floodplain and planting trees to protect the river and reduce flooding and sediment loads" (The Nature Conservancy of Illinois, 1997).

The objective of this study was to determine the historic vegetation of the Chinquapin Preserve and adjacent area in Kansas, Palestine, and Montgomery (T 25N R 1W of the 3rd PM) Townships. The three townships lie in or are adjacent to the Mackinaw River and Panther Creek floodplains in Central Illinois.

Pleistocene glacial deposits (15m - 61m in depth) over bedrock dominate the present topography of the study area (Willman and Frye, 1970). The area was covered by ice during the Kansan, Illinoian, and Wisconsinan glacial events. The Kansan glacial advance nearly filled many bedrock valleys and modified much of the drainage from an easterly to the current westerly flow. The Illinoian glaciation also added drift to many of the bedrock valleys creating a relatively flat till plain. During the Woodford sub-stage of the Wisconsinan glaciation (middle Wisconsinan), 90% of the loess accumulation (1.3m - 2.5m in depth) was deposited (Willman and Frye, 1970). The land today is nearly flat fertile farmland that is gently rolling near the major streams, and forested along ravines and waterways.

Rodgers and Anderson (1979) described the historic vegetation of adjacent McLean County, which includes the southern portion of Kansas and Montgomery Townships, but mostly occurs southeast of our study area, as being mostly prairie (89.5%). Savanna, open forest, and closed forest comprised 5.4, 1.8, and 3.4 % of the vegetation, respectively. White and black oak were the dominant tree species in the savanna and the two forest types, although the importance of both species declined from the savanna to forests. In contrast, more mesophytic species such as sugar maple, basswood, red oak, and ash had greater importance in forests than the savanna. Forests, tended to be restricted to stream valleys and dissected topography that reduced fire frequency, whereas prairies were associated with level to gently rolling topography with a higher frequency of fire than the forest or savanna (Rodgers and Anderson, 1979; Thomas and Anderson, 1990; Anderson, 1991).

The historic vegetation characteristics of the three Townships were reconstructed using the information contained in General Land Office (GLO) Survey Field Notes. The GLO field notes have been used to reconstruct presettlement vegetation in numerous previous studies (Bourdo, 1956; Anderson and Anderson, 1975; Rodgers and Anderson, 1979; Whitney and Steiger, 1985; Thomas and Anderson, 1990; Edgin and Ebinger, 1997; Nelson, 1997; and others). All of these studies applied modifications of the point-centered quarter method (Cottam and Curtis, 1956) to witness tree distances to estimate tree density at section and quarter section posts.

MATERIALS AND METHODS

Documents entitled Field Notes U. S. Surveys, also known as the General Land Office Survey (Bourdo, 1956), and Public Land Survey (PLS) field notes (Hutchinson, 1988), were obtained from the Woodford County Court House. The available records are written copies of the original field notes compiled by surveyors between 3 May 1821, and 6 December 1833. The information available from the field notes include the common name of witness or bearing trees (Bourdo, 1956) the estimated diameter at breast height

(dbh) of witness trees (Bourdo, 1956) and their distance and direction from a section or quarter section post.

The GLO surveyor's field notes included a description of the terrain traversed during the surveying of each section line. These records included the prevailing topography, condition of the land and its suitability for agriculture as well as other conspicuous features of the landscape such as cliffs, streams, rivers, lakes, vegetation (e.g., prairies, barrens, and types of timber) and roads (Hutchinson, 1988). These observations were usually recorded at the end of each mile traversed (at the section corner posts) unless there were notable changes or features encountered along the line, in which case the type, and location, of each was reported.

Applying a modified point-centered quarter method (Cottam and Curtis, 1956; Anderson and Anderson, 1975), the surveyor's tree diameter estimates and distance measures, were used to compute tree density (trees/ha), basal area (m^2/ha), relative dominance (basal area), relative density, and Importance Values ((relative density + relative dominance)/2) of witness trees by species (Anderson and Anderson, 1975). The distance from the section or quarter section post to the nearest witness tree was designated Q1, and the distance of the second closest tree was designated Q2. The Q1 and Q2 distances are equal to 0.5 and 0.8 of the square root of the mean area (√MA) of the tree populations, respectively (Cottam and Curtis, 1956). When two trees were recorded, the distances were averaged to equal 0.66 of √MA. Surveyors measured tree distances in links. A link is equal to 0.66 feet; therefore, when two distances (Q1 + Q2) are available in links the average distance in links equals the square root of the mean area of the population of trees in feet,

$$\frac{(Q1 \text{ links} + Q2 \text{ links})/2 \times 0.66 \text{ ft./ links}}{0.66} = \text{square root of the mean area (ft.).}$$

Tree density (trees/hectare) was determined by squaring the average distance in links and dividing the product into 107,639 (the square feet in a hectare).

Each section and quarter section post (point) was placed in one of four vegetation categories based on trees per hectare (Table 1), and the standard error of the mean distance for each vegetation category was calculated. For each section and quarter section point, the determined vegetation category, with a different symbol for each category, was plotted onto a plat map of the respective township to visually illustrate the distribution of the historic vegetation within the study area (Fig. 2).

Instructions to surveyors specified that they record 4 bearing trees at township corners and at section corners ("One of these trees was to stand in each of the 4 sections common to a corner") and 2 bearing trees at quarter corners (Bourdo, 1956). However, in practice this was not always done. At points where two trees were described but both occurred in the same quadrant, only the distance of the nearest tree was included in density calculations. This distance was treated as Q1 of the point centered quarter method (Anderson and Anderson, 1975). At points where three or more trees were reported, only the two nearest trees were included in density calculations. A small number of points with no bearing trees reported and given a general land description of forest were not used.

Points described as prairie with no bearing trees reported were included in the sample with a tree density and basal area of zero.

We compared the surveyor's general description and the calculated vegetation category of the nearest section or quarter section post. The purpose of this comparison was to explicate the meanings of surveyor's comments such as "barrens," "broken," and "timber." The surveyor's descriptions were also used as a guide to more accurately depict the vegetation on or near TNC's properties. We used descriptions given by two surveyors coming from different directions but arriving at the same, or nearly the same, points to get a unique perspective of the presettlement condition of TNC's property.

RESULTS

Overview of historic vegetation

The common names of 14 tree taxa were noted by the surveyors during the survey of the three townships (Table 2). Only the members of the oak genus (*Quercus*) were given common names that could be used to determine a specific epithet. Of the 304 trees recorded by GLO surveyors as witness trees (261 trees) and line trees (trees encountered by surveyors on the survey line but not at section or quarter section corners) 221 (73%) were oaks. White oaks, black oaks, and hickory dominated the study area, accounting for 89% of the trees identified. The 70 hickory trees were presumably shagbark hickory (*Carya ovata*), bitternut hickory (*C. cordiformis*), or mockernut hickory (*C. tomentosa)* as the several other hickory species native to Illinois are either rare or confined to the southern half of the state (Mohlenbrock, 1986). "Walnut," is assumed to be black walnut (*Juglans nigra*), which is common throughout the state, while white walnut or butternut occurs only occasionally (Mohlenbrock, 1986). Buckeye, mentioned by one surveyor as being part of a bottomland, is assumed to be Ohio buckeye (*Aesculus glabra*). The other two native species of *Aesculus*, sweet buckeye (*A. octandra*) and red buckeye (*A. discolor*) are rare and found only in the southern tip of Illinois (Mohlenbrock, 1986; Little, 1997). The authors believe the surveyors misidentified two of the oak species: overcup oak (*Quercus lyrata*) and post oak (*Q. stellata*). Overcup oak is confined to the southern one-half of Illinois along the Mississippi River, and the post oak is not found as far north as the study area (Mohlenbrock, 1986; Little, 1997).

The average tree densities (trees/ha) in the study area (Table 3) ranged from a low of near zero in the prairie to a high of 462.9 trees/ha in the closed forest. The basal areas ranged from zero in the prairie (<0.005 m^2/ha) to a high of 59.33 m^2/ha in the closed forest (Table 3).

Based on the percentage of section and quarter sections points in each of the vegetation categories, at the time of the GLO survey, 55.9% (190 points) of the study area was prairie, 35.3% (120 points) savanna, 2.4% (8 points) open forest, and 6.5% (22 points), closed forest (Table 3). The prairie (<0.5 trees/ha), as defined by tree density and by description given by GLO surveyors, was almost entirely devoid of trees and had a tree density of near zero (Table 3). GLO surveyors designated most prairie points by indicating "set post in mound" and described the land just traversed as being prairie. Only eight of the 190 section and quarter sections points categorized as prairie had witness trees recorded. Collectively 11 trees were noted in the prairie, nine of which were oak

trees, and three of these oaks were encountered on the survey line (line trees). Six, of the nine oak trees were identified as black oak and one was a white oak that was recorded on a survey line. The dominance of black oaks in the prairie may be contrasted with the other vegetation categories in which white oak is more important than black oak. For example, black oak has an importance value of 46.7 in the prairie, 25.4 in the savanna, 26.5 in the open forest, and 27.6 in the closed forest. White oak, however, has importance values of prairie = 0.0, savanna = 47.3, open forest = 31.0, closed forest = 66.3 (Table 4). White oak (IV [importance value] = 48.4), black oak (IV = 24.3), and hickory (IV = 16.7) were the most important trees in the study area with a combined importance value of 89.4 (of 100) (Table 4).

The savanna category (0.5 to 47.9 tree/ha) contained the most diverse tree population. Eleven of the twelve identified species recorded as witness trees occurred in the savanna (Table 4). White oak (IV = 47.3) accounted for 97 of the 235 trees encountered in the savanna. Black oak declined in importance from its highest in the prairie (IV = 50.9) to its lowest in savanna (IV = 25.4). The three taxa: white oak, black oak, and hickory had a combined importance value of 92.3 (out of 100) in the savanna.

In the open forest (48.0 to 98.8 trees/ha), only 18 trees were recorded. Of these, 15 were reported at section or quarter section posts. White oak is only marginally more important than black oak in the open forest (Table 4).

Of the 40 trees (32 witness trees and 8 line trees) recorded in the closed forest category, nearly all (37) were oaks. White oak had its highest importance value in the closed forest, with black oak a distant second (Table 4). The average density of the closed forest was 462.9 trees/ha (Table 3)

Palestine Township (T26N, R1E) and Kansas Township (T25N, R1E) were predominantly prairie (68.7% and 63.4%, respectively), whereas Montgomery Township (T25N, R1W) was chiefly savanna (54.87%) (Table 5). Open forest was the smallest vegetation category in all three townships. Kansas Township, which contains most of the Conservancy property, was 63.4% prairie and 22.3% savanna. Kansas Township open forest and closed forest categories were confined to areas near the banks of Denman and Vincent creeks, and the Mackinaw River (Fig. 2).

The TNC Chinquapin Preserve

Parcel one. Parcel one is section 5 of Kansas Township, and shares its northern border with the southern border of Palestine Township section 32. In the GLO field notes, each section corner and quarter section visited is numbered consecutively. Kansas Township surveyor posts 118, 91, 90, 88, 114, 113, and 117 border this property as well as Palestine Township surveyor posts 2, 3, and 4 (Fig. 1).

The northern half of this parcel is in the Mackinaw River basin, and is 33 m (one hundred feet) lower in elevation than the southern half (Fig. 1). The calculated tree densities of section 5 (parcel 1) range from a low of 17.0 trees/ha at post 3 in the center of the northern border, to a high of 1,260.7 trees/ha at post 117 the western quarter section post (Table 6). This unrealistically high tree density undoubtedly resulted from the chance

occurrence of witness trees close to the quarter section point and was unlikely to be reflective of the forest as a whole at this location.

Parcel Two. Parcel two is located in section 9 of Kansas Township and shares its northern border with section 4 and the parcel's northwestern corner post (88) is the southeast corner post of section 5 (Fig. 1). Quarter section post 87 is at or near the southwestern corner of parcel 2, and quarter section post 89 marks the northeast corner of the parcel. The tree density of Parcel 2 is based on one section post (88), and two quarter section posts (87, 89). The calculated density (trees/ha) ranges from a low of 11.6 at post 87 (southwest corner), to a high of 429.0 at post 89 (northeast corner) (Table 6). The land was described as "broken, not fit for cultivation," when the surveyor was traversing the western border from south to north. When moving from post 88 east to post 89, the land was described as, "…good, fit for cultivation, oak and hickory." However, the calculated density for post 89 of 429.0 placed it in the closed forest category.

Parcel Three. The south one-half of parcel three occurs in section 4 of Kansas Township, and the northern half in section 33 of Palestine Township (Fig. 1). This parcel was described by surveyors as, "2nd rate prairie" and "broken oak and hickory timber," and had a calculated tree density of zero, even though the Mackinaw River bisects the property (posts 5 and 74, Fig. 1, Table 6).

Comparison of surveyor's land descriptions

When different surveyors surveyed adjacent townships, it was possible to compare the surveyor's descriptions of the same land traversed along the shared section borders. Such was the case with the northern border of Kansas Township (T25N, R1E) surveyed by Mister A. M. Hamtramek (November 1823), and the southern border of Palestine Township (T26N, R1E) surveyed by Mister E. Steen (March 1822). Mister Hamtramek set section 5 posts (clockwise from the northwest corner) 118, 91, 90, 88, 114, 113, and 117 (Fig. 1). Mister Steen set posts 2, 3, and 4. Mister Steen's post 2 was analogous (< 1/4 mile apart) to Mister Hamtramek's post 118, and 4 was analogous to 91. At post 118, Mister Hamtramek, traversing from the south to the north described the land as, "Broken, not fit for cultivation, oak and hickory." However, traversing from west to east, Mister Steen described the land as "rolling, 2nd rate barrens, Black and white oak" at his post number 2. These descriptions are not at odds with a modern topographical map (Fig. 1). A line north from post 117 to post 118 (Hamtramek's path) crosses the Mackinaw River bottomland at about 650 ft and ascends the ancient riverbank to 750 ft on the north side of the river. The west to east survey line runs north of the convoluted ancient riverbank (Steen's route), and remains at near 750 ft.

At section post 91 (moving from south to north), Mister Hamtramek's description is again "broken, not fit for cultivation, oak and hickory." Mister Steen described the land near location (post 4) as "3rd rate timber as before (referring to his description at post 2) black and white oak" (Table 6). Mister Hamtramek's description of the land was most prophetic. The section has not been under cultivation to this date, and remains timbered.

Mister Hamtramek surveyed Parcel two and described the land as "broken, not fit for cultivation," when he surveyed the western border from post 87 to north (post 88). Post 88 has a calculated density of 298.3 placing it in the closed forest category, and the

topographic map depicts the land between posts 87 and 88 as dissected . When surveyed from post 88 east to post 89, the land was described as, "…good, fit for cultivation, oak and hickory." However, the calculated density for post 89 of 429.0 (Table 6) places it in the closed forest category. Closed forest may be an inappropriate classification for this portion of the property. Between posts 88 and 89 the land is nearly a mile away from the Mackinaw River, it changes little in altitude, and was described as fit for cultivation. These facts suggest the witness trees were perhaps coincidentally near the quarter section post giving a tree density that was too high.

Parcel three tree density is based on Mister Steen's posts 5 and 6, and Mister Hamtramek's post 74 (outside the property at the eastern corner of section 4-32). Posts 5 and 6, were surveyed from the west to the east, described as 2nd rate prairie, and listed no trees. Post 74, approached from the south to the north, is described as broken oak and hickory timber, but no bearing trees are reported (Table 6). The lack of bearing trees and Mister Steen's description place this property in the prairie category, however, this is surprising since the Mackinaw river bisects the property and river banks in this part of Illinois are usually forested.

Comparison of surveyor land descriptions and calculated vegetation categories

Of the 159 section and quarter sections points described as prairie by the surveyors, 156 of them were classified as prairie based on witness tree densities. The other three posts were calculated to be in a savanna. The description of "barrens" as used by the surveyors was divided into three categories: 1) barrens, no timber; 2) barrens, thin timber; 3) barrens, timbered. As the implied tree density of the descriptions increased (1<2<3), the frequency of points calculated as prairie decreased (Table 7). The barrens no timber and barrens thin timber had about the same percentage of points classified as savanna, 73.6 and 70.0%, respectively. However, the barrens timber has the highest percentage of points in savanna (92.3%). The barrens no timber had a small percentage of points classified as open and closed forest. The surveyor's descriptions of "broken" and "timber" were also most often classified as savanna (65.7% and 61.8%, respectively) (Table 7).

DISCUSSION

Oak and hickory dominance

The historic forest vegetation was dominated by oak and hickory trees. The accumulated importance value of oak trees within the three townships is 79.7 out of 100 possible units of importance. When oaks are combined with the hickory, this group has an importance value of 96.4. Some of this overwhelming dominance probably is due to surveyor preference when selecting witness trees. Witness trees were often selected for their "lasting qualities," or "…which are the soundest and most thrifty in appearance…which experience teaches will be the most permanent and lasting" (Bourdo 1956). When the surveyors encountered a predominately oak and hickory forest, the oak and hickory trees could naturally have been considered the most permanent and lasting. The natural large size of the oaks and hickory trees could also have caused them to be preferred over other species. Surveyors relying on tree condition and size as well as there own personal preference were susceptible to non-random choices (Bourdo 1956).

Sugar maple in historic vegetation

The sugar maple (*Acer saccharum)* one of the most prevalent trees in current Illinois forests (Ebinger, 1986) was not mentioned by the surveyors. In previous studies, using GLO field notes to reconstruct historic vegetation in central Illinois, other workers reported sugar maples in low numbers. In McLean County, Illinois, Rodgers and Anderson (1979) reported no sugar maple in the prairie, however, an IV of 3.98, 15.75, and 20.83 (total IV of 300) were reported for maple in the savanna, open forest, and closed forest, respectively (Rodgers and Anderson, 1979; see Table 3). In that same study, Rodgers and Anderson found even higher importance values, for trees identified only as maple, in Mason County, Illinois. In Mason County the importance values (total IV of 300) reported for maple were 23.4 in the prairie, 17.55 in the savanna, 34.21 in the open forest, and 41.7 in the closed forest (Rodgers and Anderson 1979, see Table 4). Similarly, in the historic forests of the Illinois Shawnee Hills of southern Illinois (Fralish et al., 1991) and in Crawford County of east central Illinois of (Edgin and Ebinger, 1997), maples were reported in few numbers. However, this leaves in question of whether there were no maple trees in our study area, or if maple trees were present but surveyor prejudices prevented their being reported.

The Three Townships

The majority of trees reported by the surveyors were calculated to be in the savanna, 235 of 304 trees. Comparisons with vegetation category based on calculated tree densities and surveyor's line descriptions indicate that most of the areas described as timber or barrens fell within the savanna category. However, most section and quarter section posts were reported in the prairie (Table 5). No witness trees were reported in 182 of the 190 points designated as prairie by the surveyor's description or calculated to be prairie by the point-centered quarter method. With a sample size of only eight witness trees in the prairie, and a standard error of the mean witness distance tree distance as a percent of the mean distance of 17.7%, these measurements may not reflect the actual state of the historic prairie. For a sample to be considered adequate to describe tree density, the standard error of the measured distances should be less than 4.65% of the mean distance (Cottam and Curtis, 1956; Rodgers and Anderson, 1979).

Adams and Anderson (1980) studied the present day forests located within a 125km radius of Normal, Illinois, which would have included this study area. They reported tree basal area in three categories: lowland (45.4m^2/ha), upland silt-loam (33.9m^2/ha) and xeric (17.7m^2/ha). The historic closed forest had more basal area (59.3 m^2/ha) than any of these forest types. However, closed forest only comprised 6.47% of the historic vegetation in this study. The remainder of the historic vegetation with reasonable sample of the tree component, savanna (1.48 m^2/ha) and open forest (10.97 m^2/ha) had low basal areas compared to the current forest. This may be due to the high frequency of disturbance (i.e. fire and ruminant browsing) to which historic open forest and savannas would have been subjected (Cottam, 1949; Curtis 1959, Fralish, et al., 1991; Anderson and Bowles, 1999). The historic closed forest would have been subjected to a lower frequency of fire than savannas and open forest. Closed forest tended to occur on dissected landscapes that were exposed to a lower frequency of fires than landscapes associated with open forests and savannas (Anderson and Bowles, 1999).

SUMMARY

The historic vegetation of Kansas, Palestine, and Montgomery Townships, as characterized by the General Land Office Surveyors, was dominated by prairie deemed fit for cultivation except in broken land. Savanna and open forests that comprised most of the non-prairie vegetation were in general more open, with lower tree densities and basal areas, than current forests. The exception to this was the closed forest, which had higher tree density and basal area than current forests. The surveyors reported oak (*Quercus spp.*) and hickory (*Carya spp.*) trees to the virtual exclusion of other species. This was illustrated by their choice of witness trees, and in their general description of "…oak and hickory timber…" at an overwhelming majority of the section posts located in or near timber. Present day forests in central Illinois have been shown to contain more maple trees, in particular sugar maple (*Acer saccharum*), than historic forests. The Conservancy's property, as described by surveyors and based on our analysis, ranged from treeless prairie to closed forest. The forests in the area of the properties were all described as, "oak hickory" forests. This study indicates that a restoration of The Nature Conservancy's properties to correspond to historic vegetation would include forests dominated by white oak, black oak, and hickory trees (with a few elm and walnut trees) near the river channel, and savanna grading into prairie away from the Mackinaw River. Sugar maple (*Acer saccharum*) should be nearly eliminated from forests on upland sites.

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Figure 1. Location of the three parcels of The Nature Conservancy's Chiquapin Preserve in Kansas and Palestine Townships, Woodford County, Illinois. Section numbers are highlighted by two horizontal and two vertical lines.

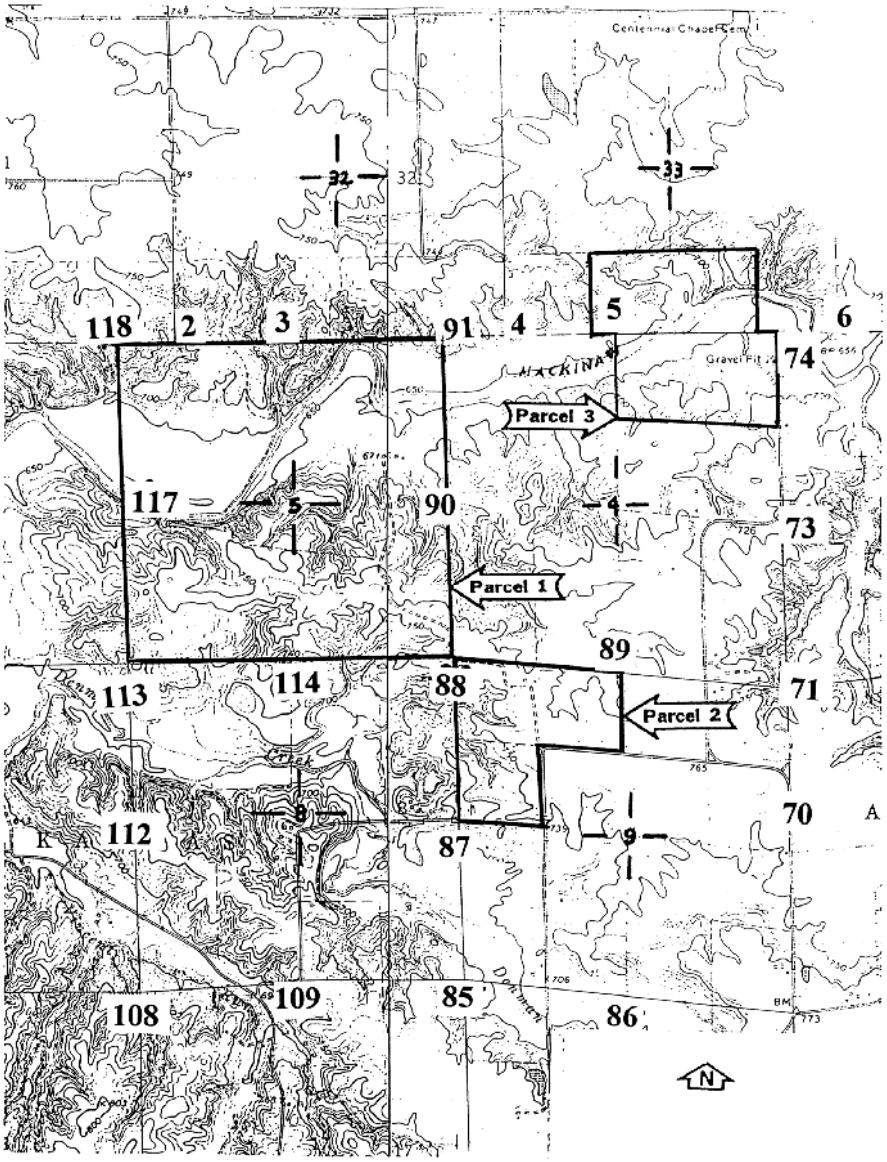

Figure 2. Historic vegetation of the study area. Legend: solid circle • = closed forest, open circle (o) = open forest, open diamond ◊ = savanna, asterisk * = prairie, dot (.) = location not visited or no information. Dashed lines indicate the assumed boundary of prairies. Number are section designations. Palestine Township (T 26N R 3E of 3rd PM) is the upper right township, Kansas Township (T 25N R 3E of 3rd PM) and Montgomery Township (T 25 N R 1W of 3rd PM) are the lower right and lower left townships, respectively.

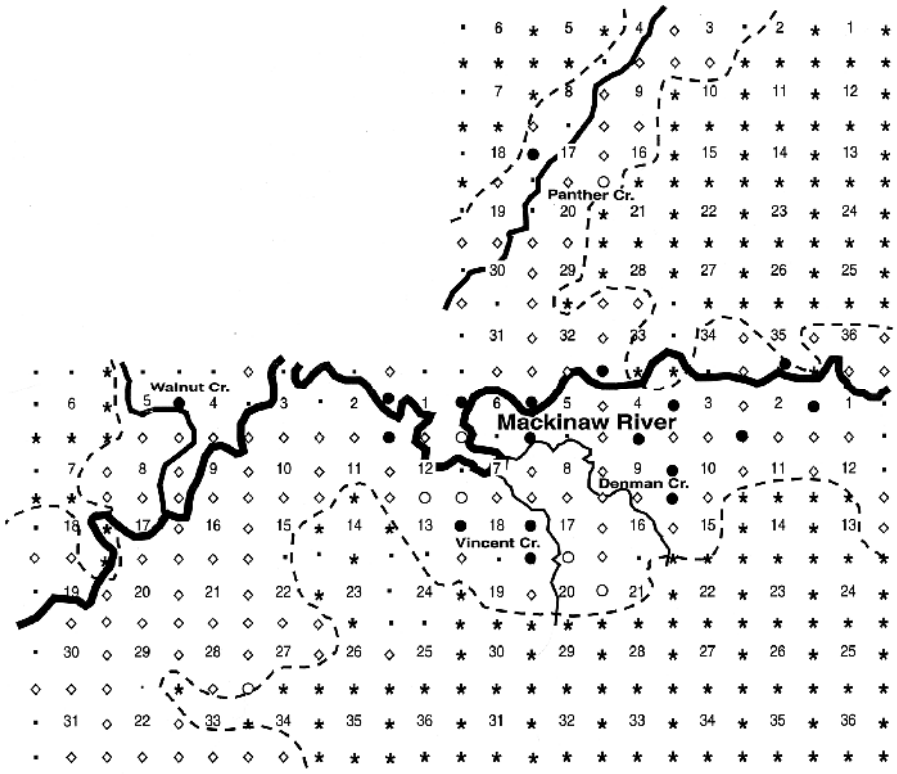

Table 1. Vegetation categories based on tree densities and surveyor description of local vegetation (Anderson and Anderson, 1975).

Vegetation Category	Tree Densities (trees/ha)
Prairie*	< 0.5 trees/ha
Savanna	0.5 trees/ha ≤ savanna < 48 trees/ha
Open Forest	48 trees/ha ≤ open forest < 98.9 trees/ha
Closed Forest	≥ 98.8 trees/ha

* Section and quarter section locations were also designated prairie based on surveyor's description of land as prairie.

Table 2. Tree species identified by surveyors. The list includes "line trees" and witness trees recorded at section and quarter section corners.

Species	Common name
Quercus alba	White oak
Q. velutina	Black oak
Q. rubra	Red oak
Q. macrocarpa	Burr oak
Q. stellata	Post oak
Q. lyrata	Overcup oak
Carya spp.	Hickory
Ulmus spp.	Elm
Juglans nigra	Walnut
Aesculus glabra	Buckeye
Juniperus virginiana	Cedar
Populus deltoides	Cottonwood
Asimina triloba	Pawpaw
Crataegus mollis	Red haw

Note: Nomenclature follows Mohlenbrock (1986); common names are those used by surveyors.

Table 3. Percent of the total vegetation within the study area, mean tree size, density, and basal area for the four vegetation categories.

	Prairie	Savanna	Open Forest	Closed Forest
% of total vegetation	55.88	35.29	2.35	6.47
Size of average tree (m^2)	0.14	0.14	0.15	0.13
Density (trees/ha)	0.001	10.27	74.99	462.87
Basal area (m^2/ha)	0.00	1.48	10.97	59.33

Table 4. Importance values of tree species by vegetation categories within the three townships studied.

Species	Prairie	Savanna	Open Forest	Closed Forest	All Categories
White oak	……	47.26	31.00	66.29	48.36
Black oak	46.73	25.38	26.54	27.64	24.30
Hickory	11.97	19.66	13.55	3.62	16.72
Overcup oak	17.92	1.43	7.07	…...	2.38
Red oak	……	1.94	……	……	2.33
Burr oak	15.70	1.37	……	……	2.07
Elm	……	0.84	9.98	2.45	1.55
Walnut	……	0.53	……	……	0.98
Cedar	……	0.81	……	……	0.56
Cottonwood	……	0.47	……	……	0.33
Post oak	……	0.32	……	……	0.22
Red haw	7.68	……	….	……	0.20

Table 5. Percent vegetation category by township.

	- - - - - - - - - - - - - - Percent - - - - - - - - - - - - - -			
Township	Prairie	Savanna	Open Forest	Closed Forest
Palestine	68.70	28.70	0.87	1.74
Montgomery	35.40	54.87	4.42	5.31
Kansas	63.39	22.32	1.79	12.50

Table 6. Surveyor post numbers, general land description on or near Nature Conservancy of Illinois property, and calculated density at post.

Post Number	Surveyor's Description	trees/ha
2	Rolling 2nd rate barrens, black and white oak	200.6
3	3rd rate timber as before	17.0
4	3rd rate timber as before (#2)	617.8
5	Rolling 2nd rate prairie	0.0
6	Rolling 2nd rate prairie	0.0
73	Broken, not fit for cult. Timber oak and hickory	140.1
74	Broken, not fit for cult. Timber oak and hickory	0.0
87	Broken, not fit for cultivation	11.6
88	Broken, not fit for cultivation	298.3
89	Land good, fit for cultivation, oak and hickory	429.0
90	Broken, not fit for cultivation	34.9
91	Broken, not fit for cultivation	429.0
113	Broken, not fit for cultivation	107.3
114	no description	none
117	Broken, not fit for cultivation-oak & hickory	1260.7
118	Broken, not fit for cultivation-oak & hickory	190.7

Table 7. Comparison of assigned vegetation class at section/quarter section points based on calculated tree density and GLO surveyor's characterization of the landscape.

	- - - - Calculated Vegetation Category - - - -				
Surveyor's Description	**Prairie**	**Savanna**	**Open Forest**	**Closed Forest**	**Total Points**
barrens, no timber	26.3%	73.6%	0	0	19
barrens, thin timber	15.0%	70.0%	5.0%	10.0%	20
barrens timbered	7.7%	92.3%	0	0	13
broken	25.7%	65.7%	0	8.6%	35
prairie	98.1%	1.9%	0	0	159
timber	10.5%	61.8%	7.9%	19.7%	76
miscellaneous	52.6%	31.6%	5.3%	10.5%	19